GEFRAN

GTF-Xtra

POWER CONTROLLER WITH OVERCURRENT FAULT PROTECTION

INSTALLATION AND OPERATION MANUAL

code **80994 - 10-2013 - ENG**

CE

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GRAPHIC SYMBOLS

To differentiate the type and importance of the information in this User Manual, graphic reference symbols are used to make such information easier to interpret.

Indicates contents of sections, general instructions, notes, and other points to which the reader’s attention needs to be called.

Indicates a suggestion based on the experience of GEFRAN’s Technical Personnel that could be especially useful under certain circumstances.

Indicates a particularly delicate situation that could affect the safety or correct operation of the controller, or an instruction that MUST be followed to prevent hazards.

Indicates a reference to Detailed Technical Documents available on the GEFRAN website www.gefran.com.

Indicates a risk to the user’s safety due to high voltage at the points indicated.

1 • PRELIMINARY INSTUCTIONS

1.1 PROFILE

The Gefran GTF-Xtra power controller combines the functionality of a single, two or three phase solid-state power unit and controller with the benefits of the unique integrated overcurrent fault protection function.
The fault protection eliminates the need for extra-rapid fuses, reducing machine downtime and the cost of replacing fuse failures. It does so by instantaneously monitoring load current, cutting the power if the load reaches a pre-set threshold and isolating the power switching devices.
In applications susceptible to intermittent short-circuits and overloads, the Gefran Xtra power controller can be programmed to restore power automatically when the fault has cleared, preventing complete process shutdown and maintaining production.
Alternatively, power can be manually restored, locally or remotely.
A soft-start ramp is applied when the current is restored, to prevent system damage in the event that the fault is not effectively cleared.
The GTF-Xtra controller is compact, modular and optimised to control virtually any type of restive heating system in a wide range of industrial applications.
Impressive functionality is assured by a comprehensive array of options that are configurable with intuitive, guided-set-up, PC-based Windows^{tm} software.
GTF-Xtra always provides an RS485 serial connection with Modbus RTU protocol to control currents, voltages, powers, load status, and device status from the supervisor terminal (HMI) or PLC

GTF runs complete diagnostics of current, voltage, power, and temperature levels:

Current Diagnostics:
- Total and partial load interrupt alarm
- Self-learn function of alarm limit for interrupted load
- Alarm for SSR in short circuit
- Alarm for load in short circuit or overcurrent

Voltage Diagnostics:
- Alarm for absence of phase

Temperature Diagnostics:
- Alarm for over temperature of power module

Power control with Soft start ramp limits load, optimizes the consumptions and increases the load operating duration.
This exclusive function is a resettable internal protection against overcurrents: it eliminates the external (always problematic) use of high-speed fuses and greatly reduces the length and cost of machine downtime caused by a search for new fuses.
Device parameters can be configured from PC, by means of a simple configuration SW which lets you save all parameters in a configuration file that is easy to manage and to copy to other devices.
Moreover, an RS485 serial connection of GTF is offered with Modbus RTU protocol to control currents, voltages, powers, load status, and device status from the supervisor terminal (HMI) or PLC.

The section contains general information and warnings to be read before installing, configuring and using the controller.

1.2 GENERAL DESCRIPTION

GTF is single-zone advanced solid state power unit, extremely compact, equipped with different optional functions; it offers an exclusive combination of performance, reliability, and flexibility.
In particular, this new line of Gefran controllers is the ideal solution for sectors demanding high performance and continuity of service, such as:
- Metal heat treating furnaces
- Vacuum furnaces with graphite elements
- High-temperature furnaces
- Boosters for glass lines
- Quick cutting on blow molding lines
- Machines and lines with unwanted current peaks and arcs
- “Fuse-free” solutions

The modules series GTF controllers are based on an extremely versatile hardware and software platform, with options to select the best I/O configuration for your system.
GTF is used for the power control of single-phase and 2-phase loads, including resistive loads with high and low temperature coefficient, short wave IR lamps, or transformer primaries.

Attention: the description of programming and configuration parameters are contained in the “Programming and configuration” manual, downloadable from the website www.gefran.com

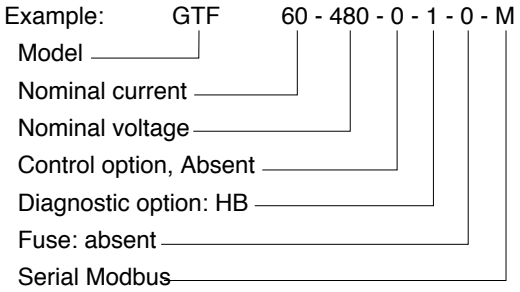
1.3 PRELIMINARY INSTRUCTION

Read the following preliminary instructions before installing and using the GTF modular power controller.
This will make start-up faster and avoid some problems that could be mistakenly interpreted as malfunctions or limitations of the controller.

Immediately after unpacking the unit, check the order code and the other data on the label attached to the outside of the container.
Write them on the following table.
This data must always be available and given to Gefran

SN.....	(Serial number)
CODE	(Product code)
TYPE.....	(Order code)
SUPPLY.....	(Power Supply)
VERS.	(Firmware version)

Customer Care representatives are available if technical service is needed. Check that the controller is in perfect condition, was not damaged during shipment, and that the package also contains the “Configuration and Programming” manual.
Immediately report any errors, shortages, or signs of damage to your Gefran dealer.
Check that the order code matches the configuration requested for the intended application by consulting the section:
“Technical-Commercial Information.”



See paragraph 2.1 “ Dimensions and mounting” before installing the GTF on the machine/host system control panel.
To configure the PC use the SW Gefran GF-Express kit and the relative connection cable.
For the order code, see Section:
“Technical-Commercial Information”.

Users and/or system integrators who want detailed information on serial communication between Gefran standard and/or industrial PCs and Gefran Programmable Instruments can access Technical Reference Documents on serial communication and MODBus protocol, etc., in Adobe Acrobat format on the Gefran website **www.gefran.com**:

- Serial Communication
- MODBus Protocol

Before calling Gefran Customer Care in case of assumed malfunctions, please see the Troubleshooting Guide in the “Maintenance” section and, if necessary, the F.A.Q. (Frequently Asked Questions) section on the Gefran website
www.gefran.com

This section contains the instructions needed for correct installation of GTF controllers on the machine/host system control panel and for correct connection of the power supply, inputs, outputs and interfaces.

CAREFULLY READ THE FOLLOWING WARNINGS BEFORE INSTALLING THE INSTRUMENT! Disregard of such warnings could create electrical safety and electromagnetic compatibility problems, as well as void the warranty.

2.1 Electrical power supply

- the controller DOES NOT have an On/Off switch: the user must install switch/isolator conforming to safety requisites (CE mark) to cut off the power supply up-line of the controller.
  The switch must be installed in the immediate vicinity of the controller in easy reach of the operator.
  A single switch can be used for multiple devices.

* the earth connection must be made with a specific lead.

- if the product is used in applications with risk of harm to persons or damage to machines or materials, it MUST be equipped with auxiliary alarm devices.
  It is advisable to provide the ability to check for tripped alarms during regular operation.
  DO NOT install the product in rooms with hazardous (inflammable or explosive) atmosphere; it may be connected to elements that operated in such atmosphere only by means of appropriate interfaces that conform to current safety standards.

2.2 Notes on electrical safety and electromagnetic compatibility:

2.2.1 CE MARKING: EMC (electromagnetic compatibility) conformity

in compliance with Directive 2004/108/CE and following modifications.
Series GTF controllers are mainly intended for industrial use, installed on panels or control panels of production process machines or systems.
For purposes of electromagnetic compatibility, the most restrictive generic standards have been adopted, as shown on the table.

2.2.2 LV (low voltage) conformity

in compliance with Directive 2006/95/CE.

EMC compliance has been verified with respect to the information in Tables 1 and 2.

2.3 Recommendations for Correct Installation for purposes of EMC

2.3.1 Instrument power supply

- The power supply for the electronic instrumentation on the panels must always come directly from a cut-off device with fuse for the instrument part.
- Electronic instrumentation and electromechanical power devices such as relays, contactors, solenoids, etc., MUST ALWAYS be powered by separate lines.
- When the power supply line of electronic instruments is heavily disturbed by switching of thyristor power groups or by motors, you should use an isolation transformer only for the controllers, grounding its sheathing.
- It is important for the system to be well-grounded:
  - voltage between neutral and ground must not be > 1V
  - Ohmic resistance must be < 6Ω;
- If the grid voltage is highly unstable, use a voltage stabilizer.
- In proximity of high-frequency generators or arc welders, use adequate grid filters.
- The power supply lines must be separate from instrument input and output lines.

•Supply from Class II or from limited energy source

2.3.2 Input and output connections

Before connecting or disconnecting any connection, always check that the power and control cables are isolated from voltage
Appropriate devices must be provided: fuses or automatic switches to protect power lines.
The fuses present in the module function solely as a protection for the GTF semiconductors.

- Connected outside circuits must be doubly isolated.
- To connect analog inputs, strain gauges, linears, (TC, RTD), you have to:
  - physically separate the input cables from those of the power supply, outputs, and power connections.
  - use braided and shielded cables, with sheathing grounded at a single point.

2.3.3 Installation notes

Install the voltage stabilizer enclosed with the product (see Installation section).

- Moreover, the applications with solid-state units require a safety automatic switch to section the load power line.
  To ensure maximum reliability, the device must be correctly installed in the panel in such a way as to obtain adequate heat exchange between the heat sink and the surrounding air under conditions of natural convection..
  Fit the device vertically (maximum angle 10° to the vertical axis) see figure 3
  • Vertical distance between a device and the panel wall >100mm
  • Horizontal distance between a device and the panel wall at last 10mm
  • Vertical distance between a device and the next one at last 300mm.
  • Horizontal distance between a device and the next one at last 10mm.

Check that the cable holder runners do not reduce these distances, in this case fit the cantilever units opposite the panel so that the air can flow vertically on the dissipator without any obstacles.

- dissipation of device thermic power with effects on installation room temperature.
- thermal power dissipation with limits on installation room temperature.
- requires exchange with external air or an air conditioner to transfer dissipated power outside the panel.
- maximum limits of voltage and derived power of transients on the line, for which the solid state power unit contains protective devices (based on the model).
- presence of dispersion current in GTF in non-conducting state (current of a few mA due to RC Snubber circuit to protect).

GEFRAN S.p.A. assumes no liability for any damage to persons or property deriving from tampering, from incorrect or improper use, or from any use not conforming to the characteristics of the controller and to the instructions in this User Manual.

Table 1 EMC Emission

AC semiconductor motor controllers and conductors for non-motor loads	EN 60947-4-3	
Emission enclosure compliant in firing mode single cycle and phase angle if external filter fitted	EN 60947-4-3 CISPR-11 EN 55011	Class A Group 2

Table 2 EMC Immunity

Generic standards, immunity standard for industrial environments	EN 60947-4-3	
ESD immunity	EN 61000-4-2	4 kV contact discharge 8 kV air discharge
RF interference immunity	EN 61000-4-3 /A1	10 V/m amplitude modulated 80 MHz-1 GHz 10 V/m amplitude modulated 1.4 GHz-2 GHz
Conducted disturbance immunity	EN 61000-4-6	10 V/m amplitude modulated 0.15 MHz-80 MHz
Burst immunity	EN 61000-4-4	2 kV power line 2 kV I/O signal line
Surge immunity	EN 61000-4-4/5	Power line-line 1 kV Power line-earth 2 kV Signal line-earth 2 kV Signal line-line 1 kV
Magnetic fields immunity	Test are not required. Immunity is demonstrated by the successful completion of the operating capability test	
Voltage dips, short interruptions and voltage immunity tests	EN 61000-4-11	100%U, 70%U, 40%U,

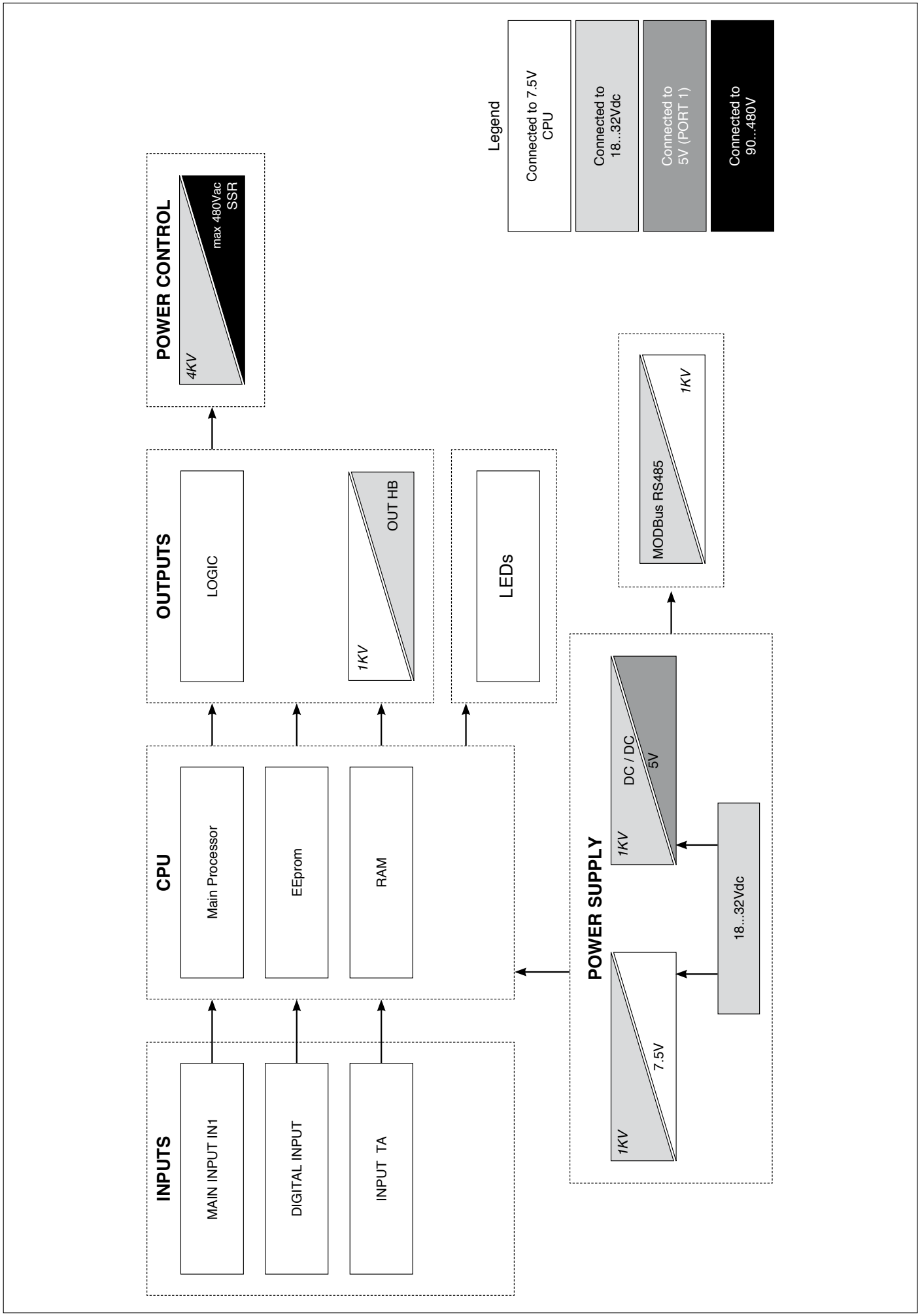
Table 3 LVD Safety

Safety requirements for electrical equipment for measurement, control and laboratory use	EN 61010-1 UL 508	

ATTENTION
This product has been designed for class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

EMC filters are required in PA mode (Phase Angle, i.e., SSR trigger with phase angle modulation).
The filter model and current level depend on the configuration and load used.
The power filter MUST by connected as close as possible to the GTF.
You can use a filter connected between the power line and GTF or an LC group connected between the GTF output and the load.

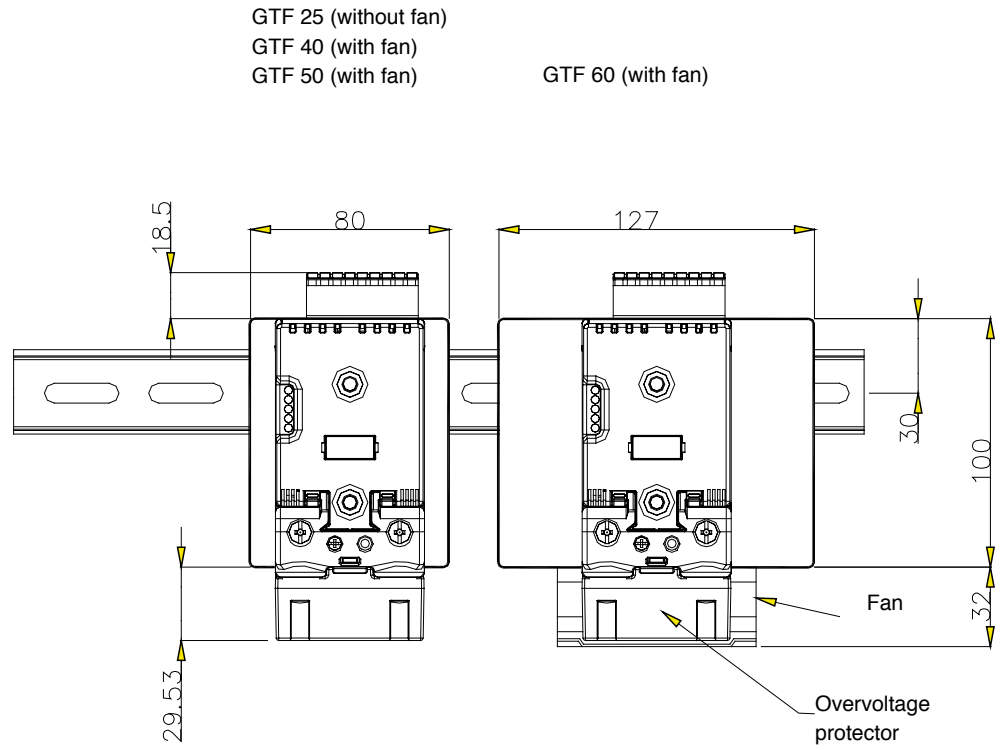
The CE declaration of conformity is available on request


Legend
Connected to 7.5V CPU
Connected to 18...32Vdc
Connected to 5V (PORT 1)
Connected to 90...480V
POWER CONTROL
4KV
max 480Vac SSR
OUTPUTS
LOGIC
1KV
OUT HB
LEDs
MODBus RS485
1KV
CPU
Main Processor
EEprom
RAM
POWER SUPPLY
1KV
DC / DC
5V
18...32Vdc
1KV
7.5V
INPUTS
MAIN INPUT IN1
DIGITAL INPUT
INPUT TA

2.4 DIMENSIONS

Fastening may be done on DIN guide (EN50022) or with (5MA). See figures 1 and 2.
All dimensions are expressed in mm.

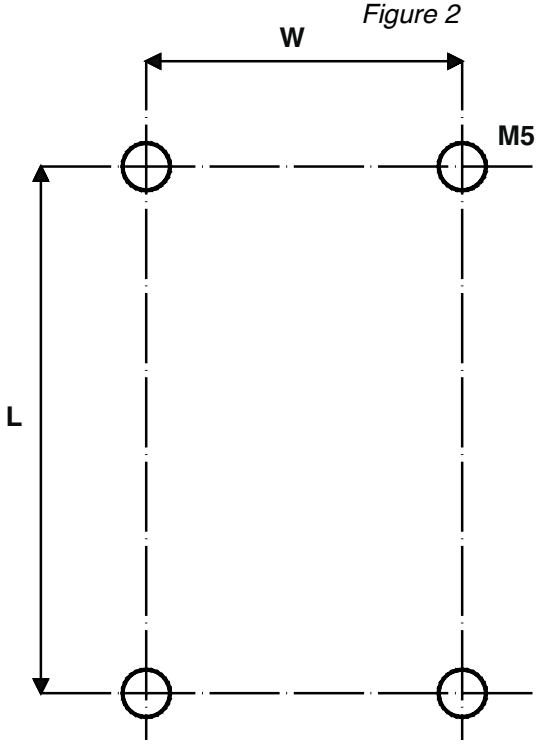
Figure 1



Fastening may be done on DIN guide (EN50022) or with (5MA).
All dimensions are expressed in mm.

2.4.1 TEMPLATE DIMENSIONS

Figure 2

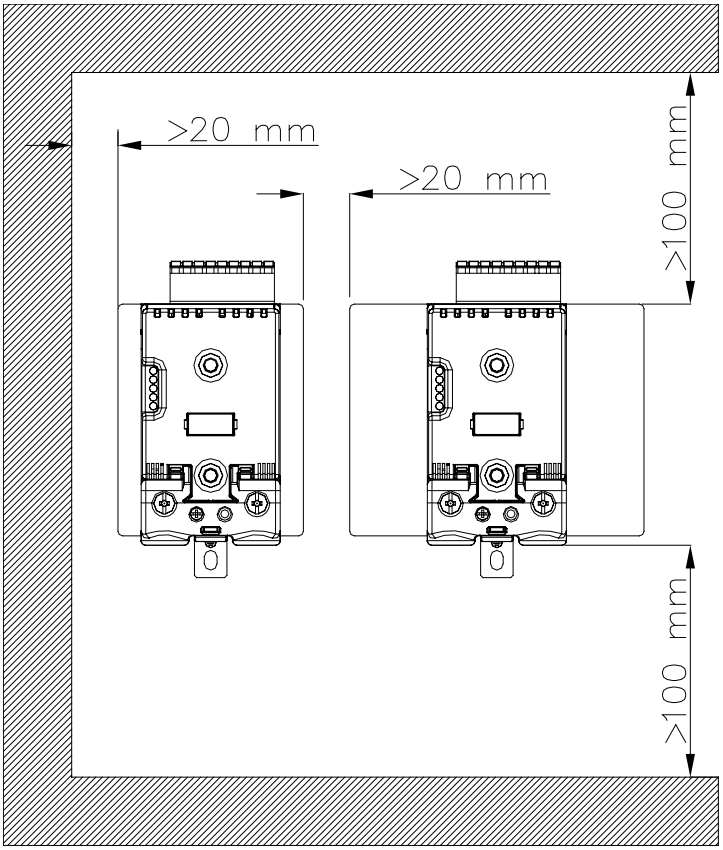


	L (mm)	W(mm)
Models		
GTF 25-40-50A:	112	44
GTF 60A:	112	113

2.5 INSTALLATION

Attention: respect the minimum distances shown in figure 3 to provide adequate air circulation.

Figure 3



For correct attachment/release of the module on the DIN guide, do as follows:
- keep the attach/release cursor pressed
- insert/remove the module
- release the cursor

Figure 4

PHASE ATTACHMENT

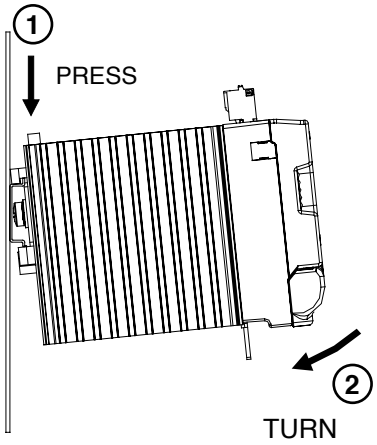


Figure 5

GTF
locked properly
to DIN bar

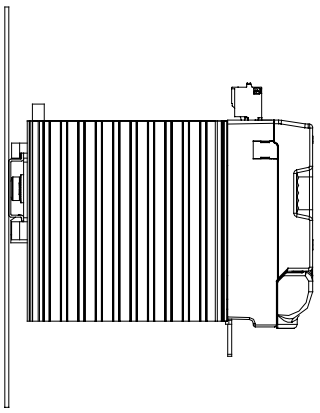
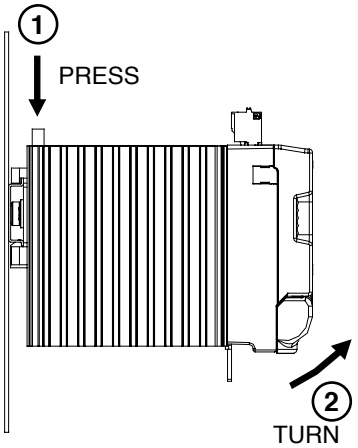


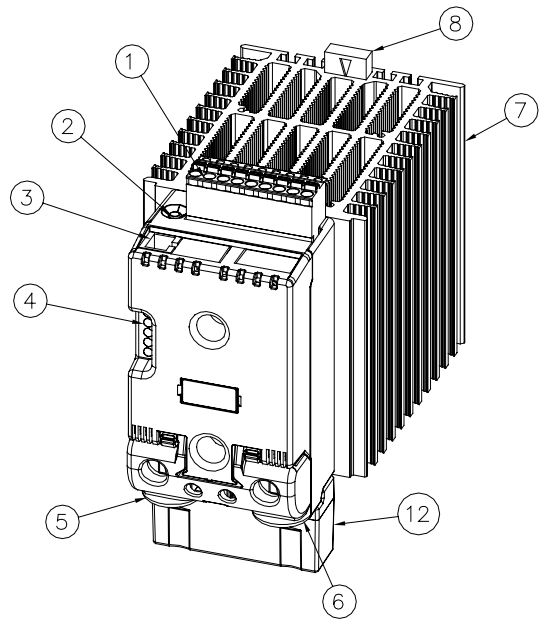
Figure 6

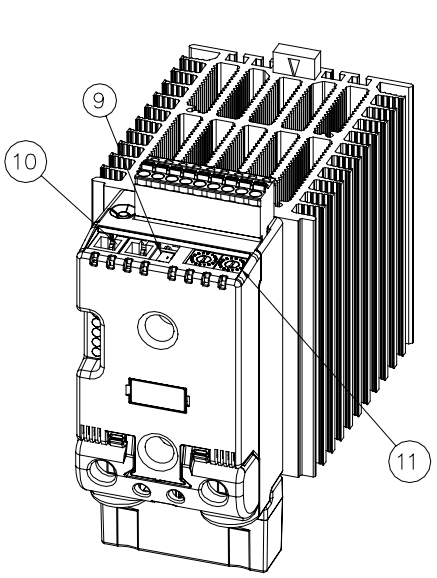
PHASE RELEASE



2.6 GENERAL DESCRIPTION GTF 25-60A

Figure 7





1. Supply/control connnector
2. HB key calibration
3. TTL port for configuration
4. LED indicators
5. Power terminal “Line” (1/L1)
6. Power terminal “Load” (2/T1)
7. Heatsink
8. Attachment DIN bar
9. Switch serial line terminal
10. RS485 serial port connector
11. Address Rotary switch
12. GTF Surge protector

3 • ELECTRICAL CONNECTIONS

3.1 POWER CONNECTIONS

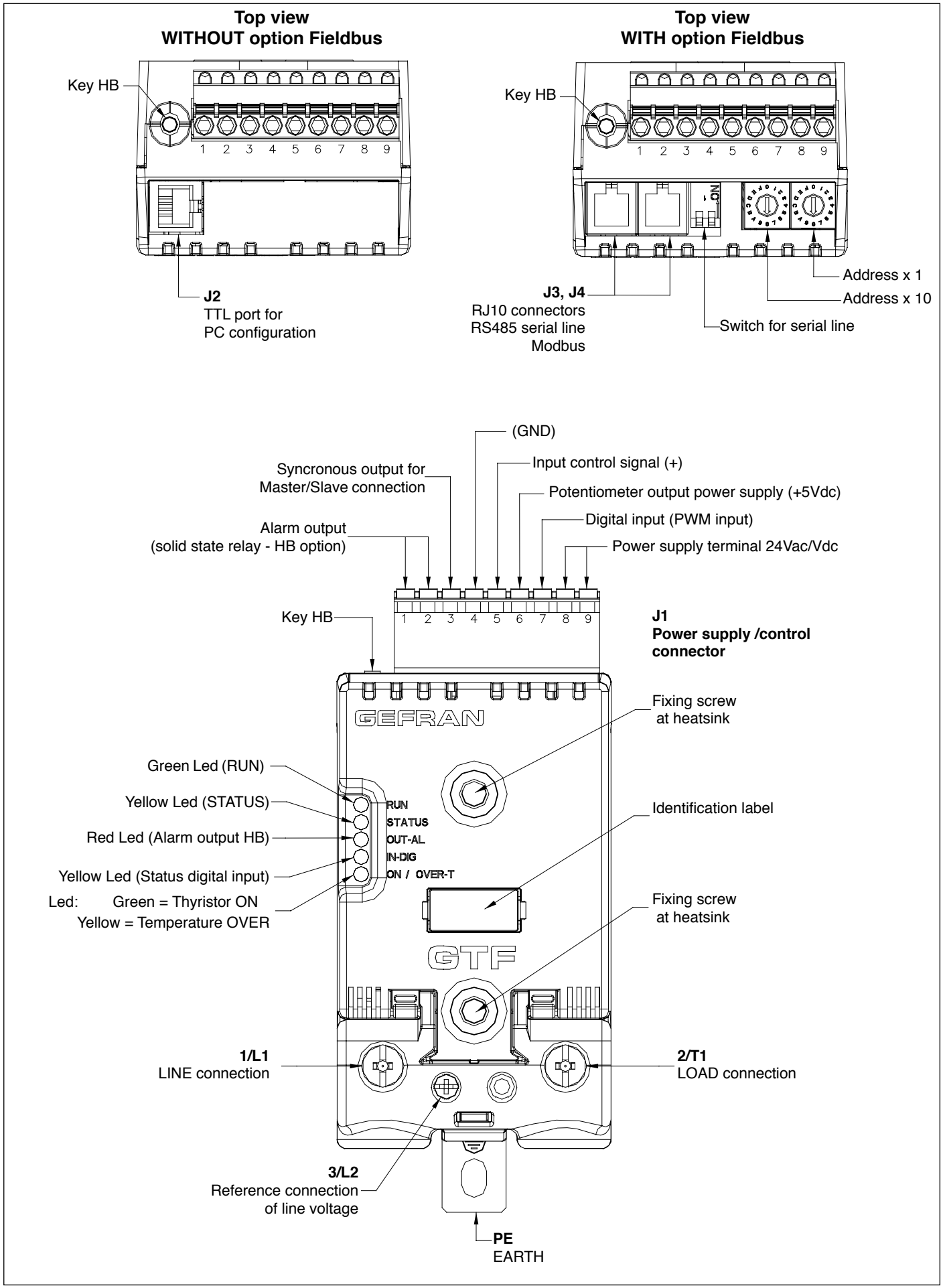
RECOMMENDED WIRE GAUGES

Table 4

GTF CURRENT LEVEL	TERMINAL	CABLE WIRE	WIRE TERMINAL	TIGHTENING TORQUE / TOOL
25A	1/L1, 2/T1, PE	4 mm² 10 AWG	Wire terminal / Eye D. 6mm	2 ...2.5 Nm / Phillips screwdriver PH2 - PH3
40A	1/L1, 2/T1, PE	10 mm² 7 AWG	Wire terminal / Eye D. 6mm	2 ...2.5 Nm / Phillips screwdriver PH2 - PH3
50A	1/L1, 2/T1, PE	10 mm² 7 AWG	Wire terminal / Eye D. 6mm	2 ...2.5 Nm / Phillips screwdriver PH2 - PH3
60A	1/L1, 2/T1, PE	16 mm² 5 AWG	Wire terminal / Eye D. 6mm	2 ...2.5 Nm / Phillips screwdriver PH2 - PH3
-	3/L2 (Ref. Vline)	0.25 ...2.5 mm² 23...14 AWG	wire terminal tip	0.5 ...0.6 Nm / Screwdriver blade 0.6 x 3.5 mm

3.2 Connections Input/Output GTF 25-120A

Figure 8



3.4 FUNCTIONS OF INDICATOR LEDS

Description of LEDs

Table 5

LED	DESCRIPTION	COLOR
RUN	Flashing during normal operation	green
	On steadily: according to FW setting (see SW manual)	
STATUS	Off : during normal operation	yellow
	On : according to FW setting (see SW manual)	
ALARM	State HB alarm output / Power Fault Alarm / Fuse Open	red
DI	State digital input	yellow
ON / OVER-TEMP	.Green: SSR on control state	green
	Yellow: ON SSR overtemperature alarm	yellow

The state of the LEDs matches the corresponding parameter, except in the following special cases:
- LED 1 (green) + LED 2 (yellow) both flashing rapidly: autobaud in progress
- LED 2 (yellow) flashing rapidly: SSR temperature sensor broken or SSR Over Heat or Rotation Error or Load_short_protection

3.5 CONTROL CONNECTOR

3.5.1 CONNECTOR J1

Figure 9

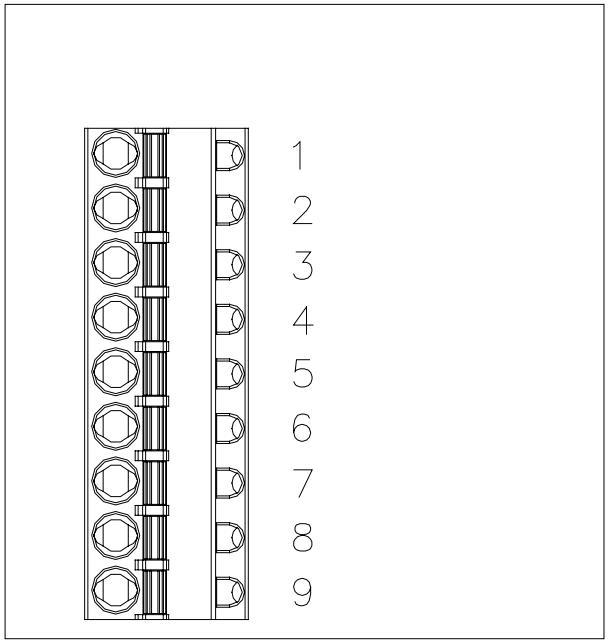


Table 6

	0,2 - 2,5mm²	**24-14AWG**
	0,25 - 2,5mm²	**23-14AWG**

Figure 10 *Connection schema J1*

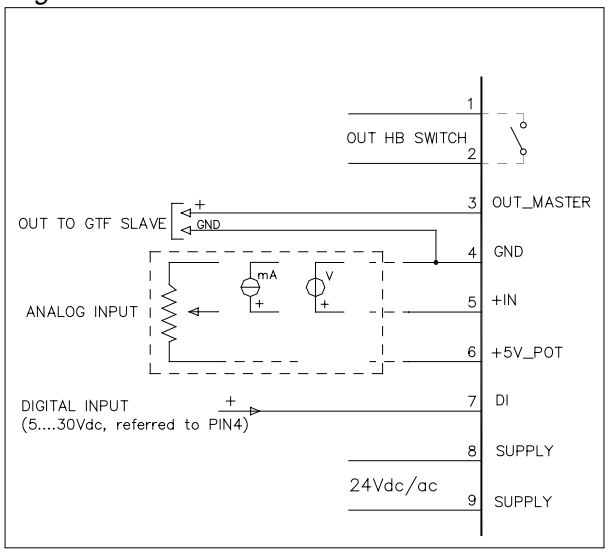
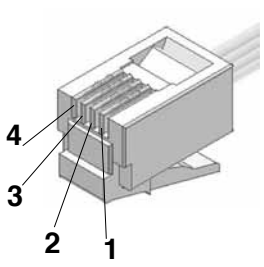


Table 7

PIN	NAME	DECRIPTION
1	OUT AL HB	OUT Alarm Switch (HB)
2		
3	OUT_Master	Control output Slave (+7V)
4	GND	GND Control analog input
5	+ IN	+ Control analog input
6	+5V_POT	Output alim. potentiometer
7	IN_DIG	Digital input & PWM Input
8	24V Supply	Supply 18...32 Vac/Vdc
9	24V Supply	

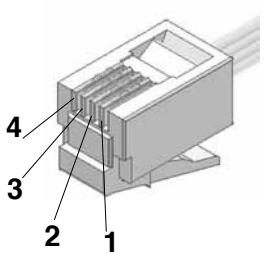
3.6 CONFIGURATION TTL PORT (GTF STANDARD)

CONNECTOR J2 GTF

Connector S1/S2 RJ10 4-4 pin	Nr. Pin	Nome	Description	Note
	1	GND	Ground	The use of this port is recommended to configure parameters by Accessory Gefran cable code F049095 (USB / TTL)or Gefran cable code F043956 (RS232 / TTL) ONLY
	2	RX_TTL	Data reception TTL from GTF	
	3	TX_TTL	Data transmission TTL to GTF	
	4	(Reserved Gefran)	DO NOT connect	
Cable type: flat telephone cable for pin 4-4 conductor 28AWG				

3.7 SERIAL COMMUNICATION PORTS MODBUS RS485 (Option)

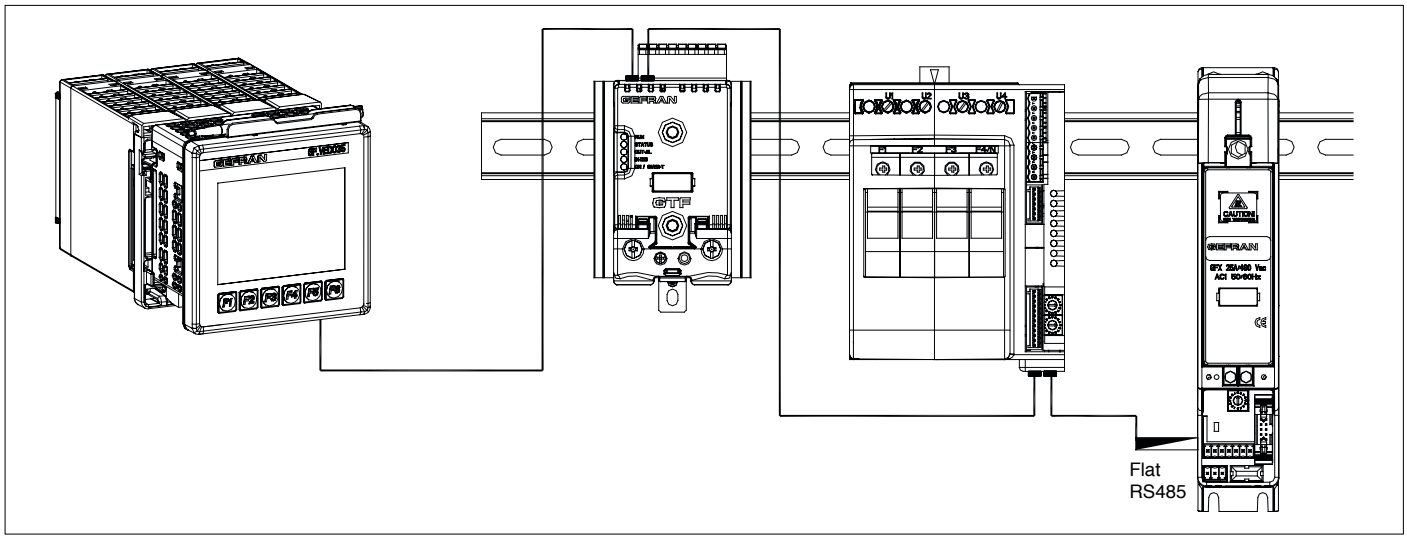
CONNECTORS J3, J4 GTF

Connector S1/S2 RJ10 4-4 pin	Nr. Pin	Name	Description	Note
	1	GND1 (**)		(*) Insert the RS485 line termination in the last device on the Modbus line, see dip-switches. (**) Connect the GND signal between Modbus devices with a line distance > 100 m.
	2	Tx/Rx+	Data reception/transmission (A+)	
	3	Tx/Rx+	Data reception/transmission (B-)	
	4	+V (reserved)		
Cable type: flat telephone cable for pin 4-4 conductor 28AWG				

3.8 CONNECTION EXAMPLE: COMMUNICATION PORTS

Integration of GTF with GEFLEX modules connected in RS485 Modbus

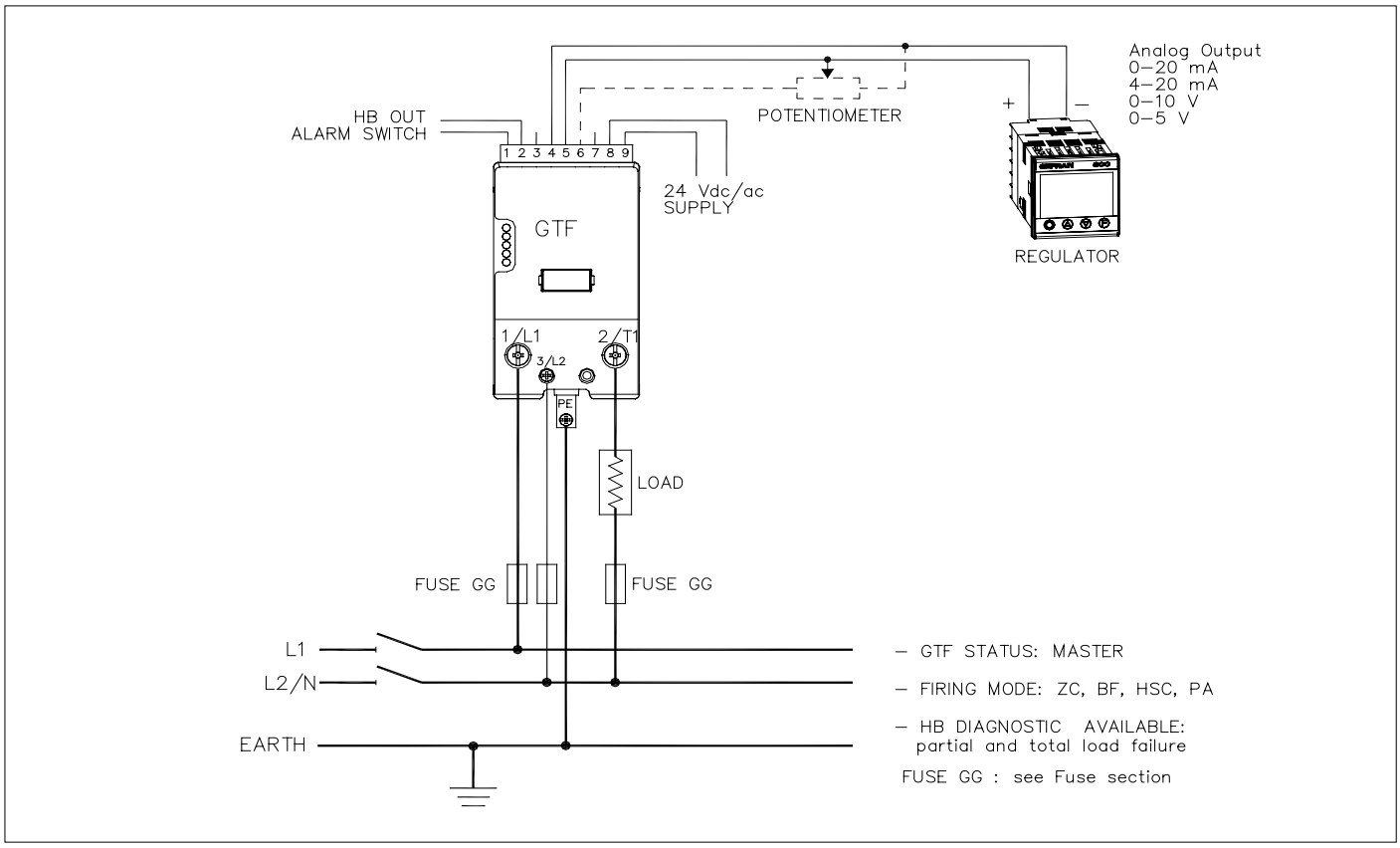
Figure 11



3.9 CONNECTION EXAMPLE: POWER SECTION

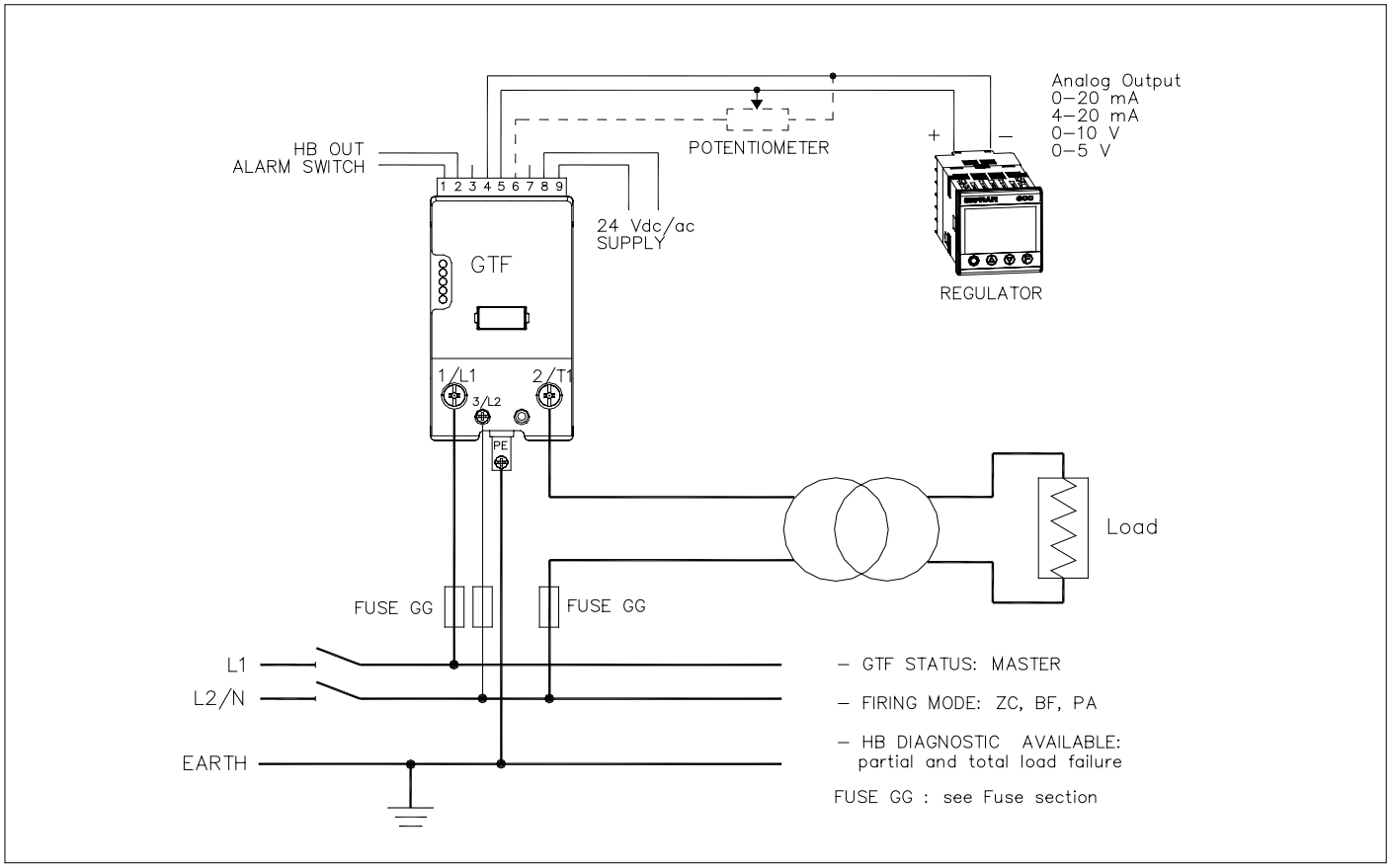
Connection example GTF for 1 single-phase load, single-phase line (L1-N) or open delta (L1-L2)

Figure 12



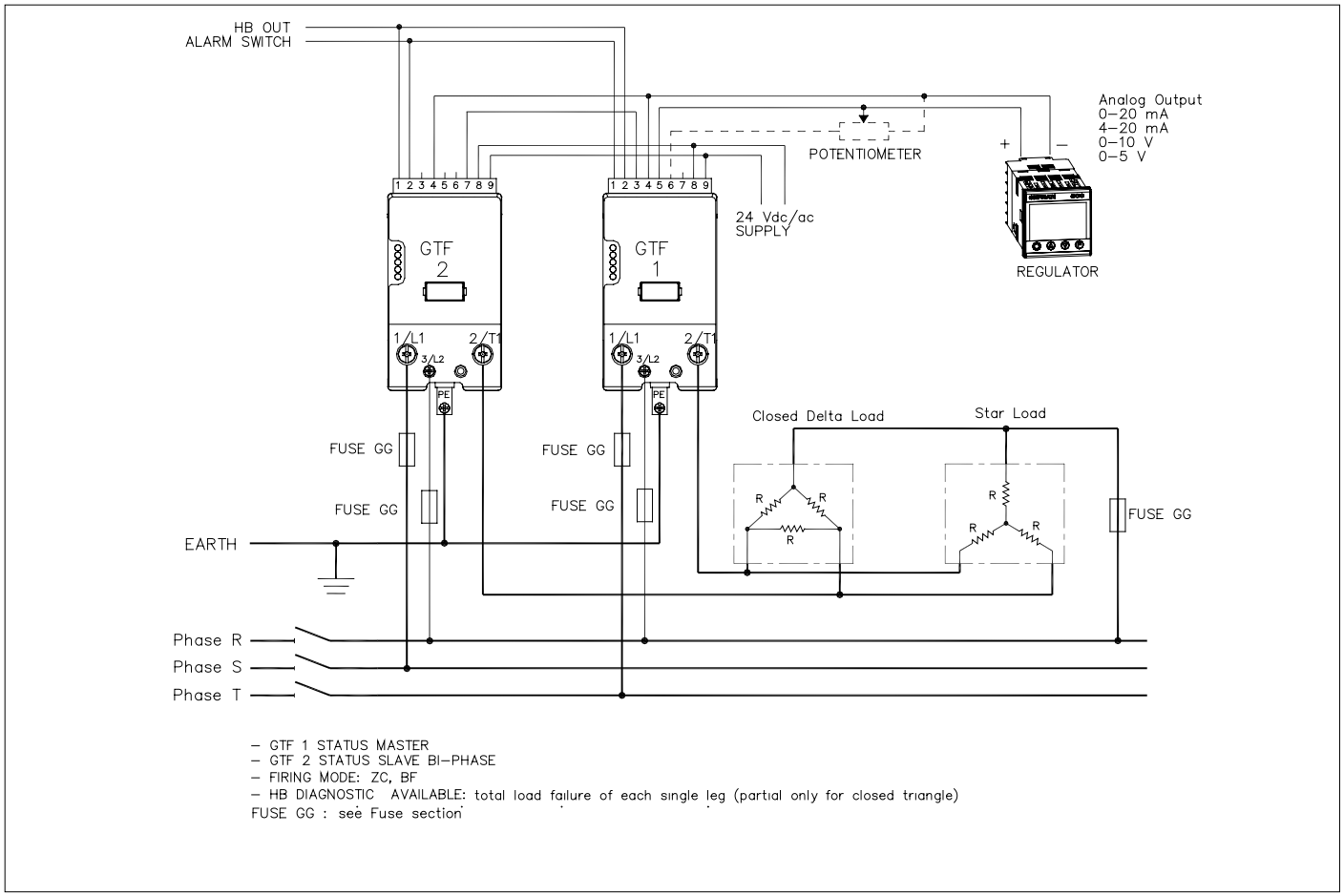
Connection example GTF for 1 single-phase load with transformer single-phase line (L1-N) or open delta (L1-L2) .

Figure 13



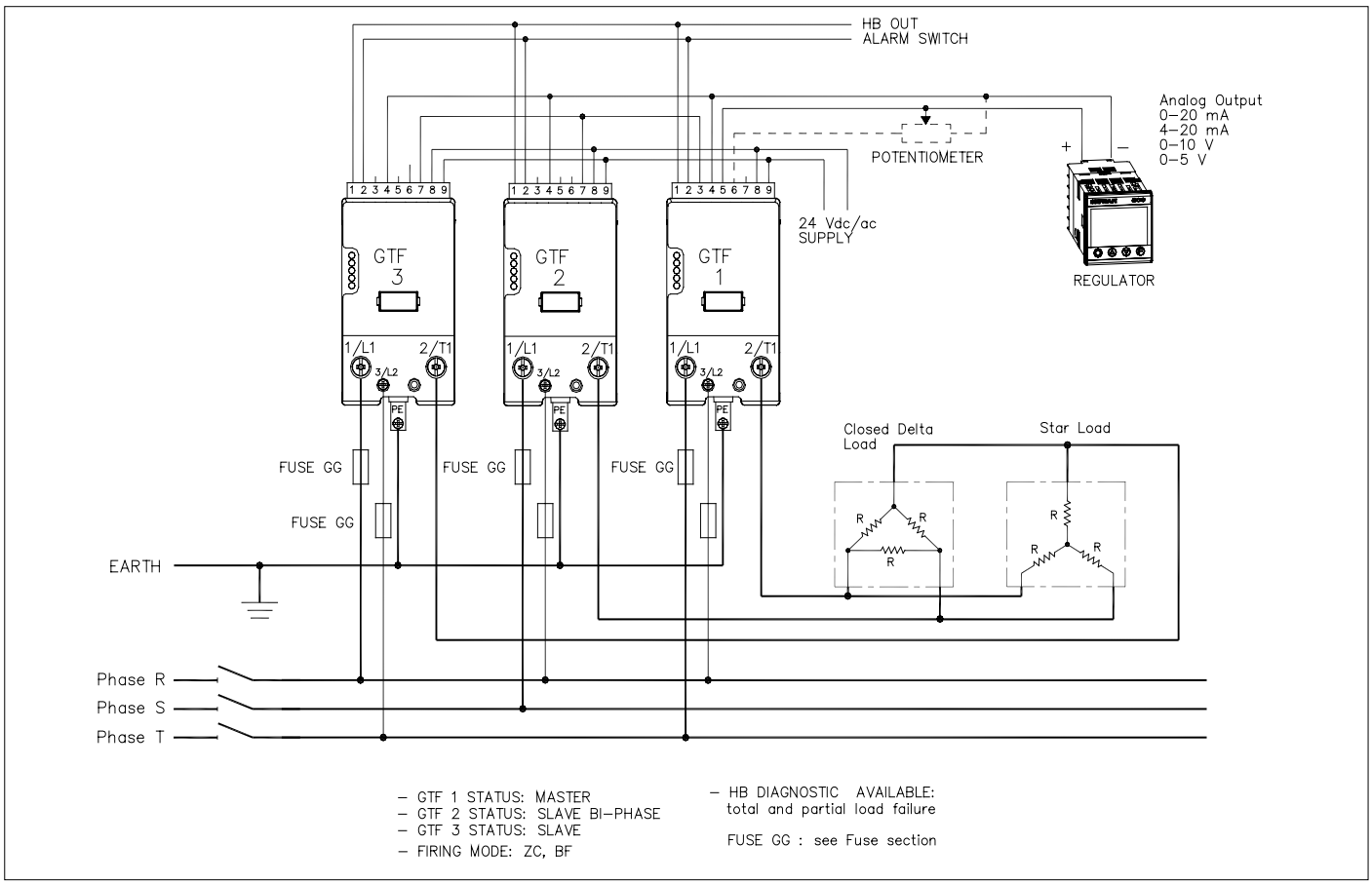
Connection example 2-phase (Master-Slave) GTF for one load 3-phase

Figure 14



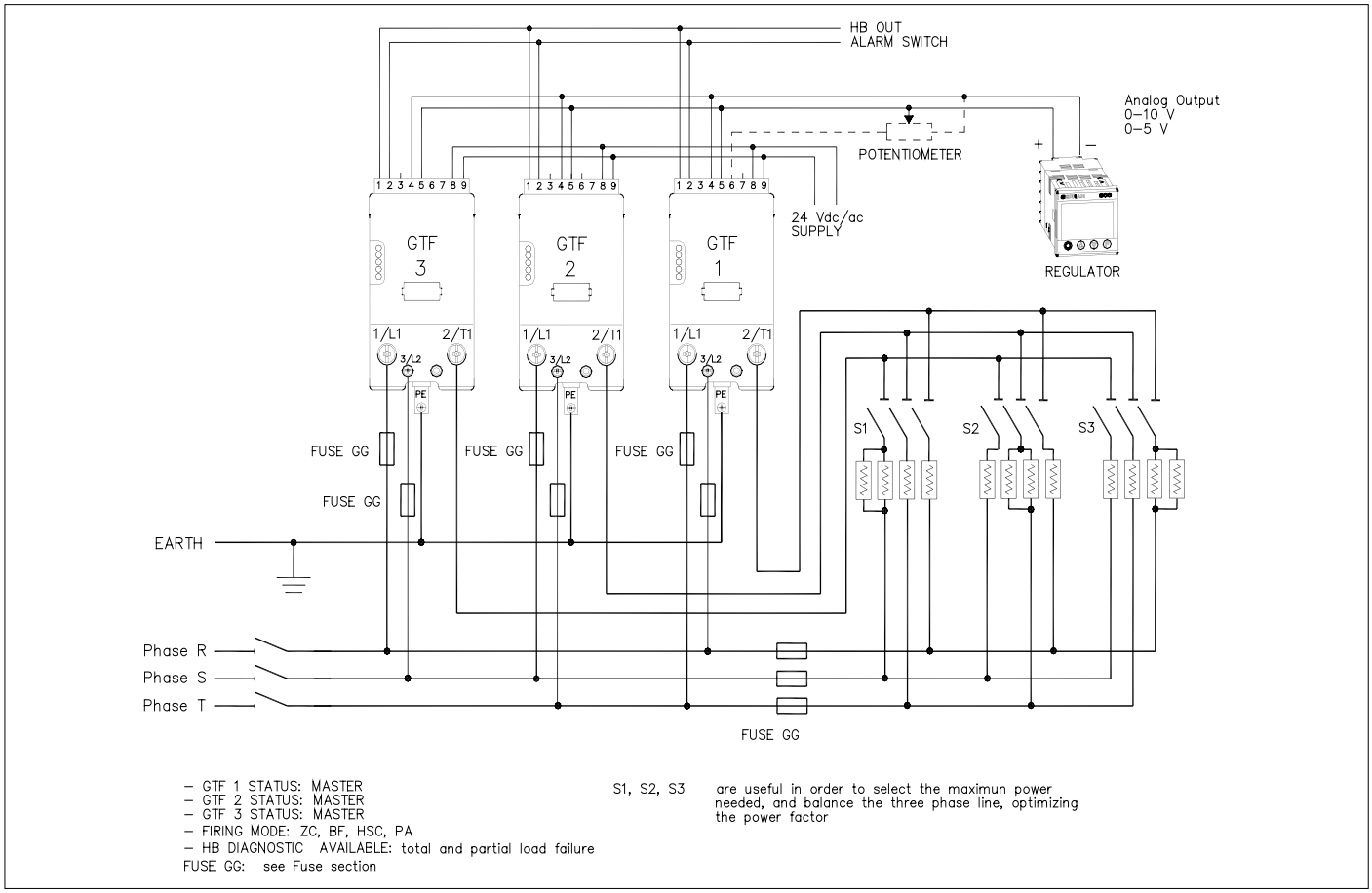
Connection example 3-phase (Master-Slave with control on 3 lines) GTF for one load 3-phase

Figure 15



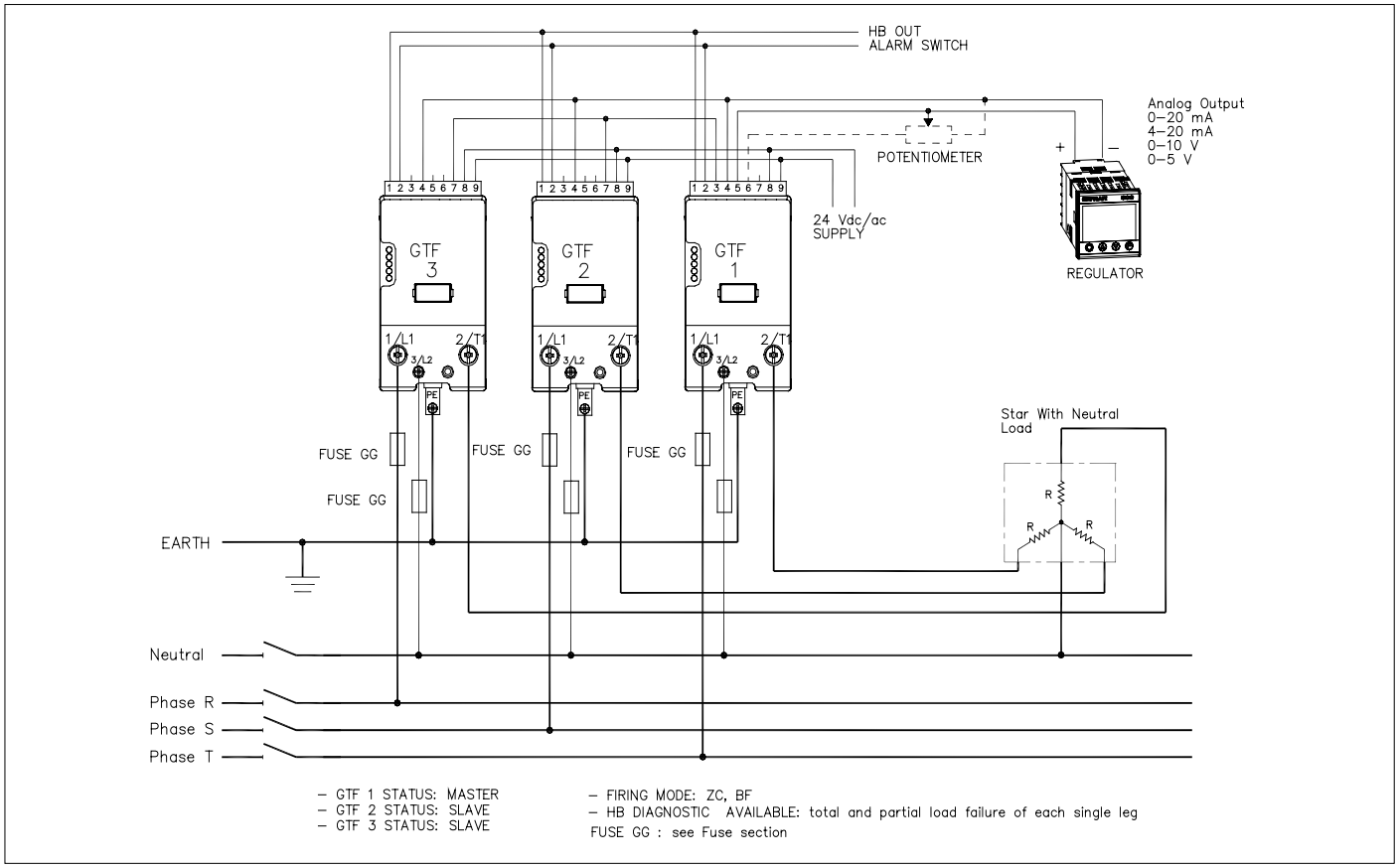
Connection example GTF three-phase (3 master units) for single-phase loads, with division of maximum load with isolators S1, S2, S3, maintaining balance of three-phase line.

Figure 16



Connection example GTF (with N. 3 GTF) for 3-phase star load with neutral

Figure 17



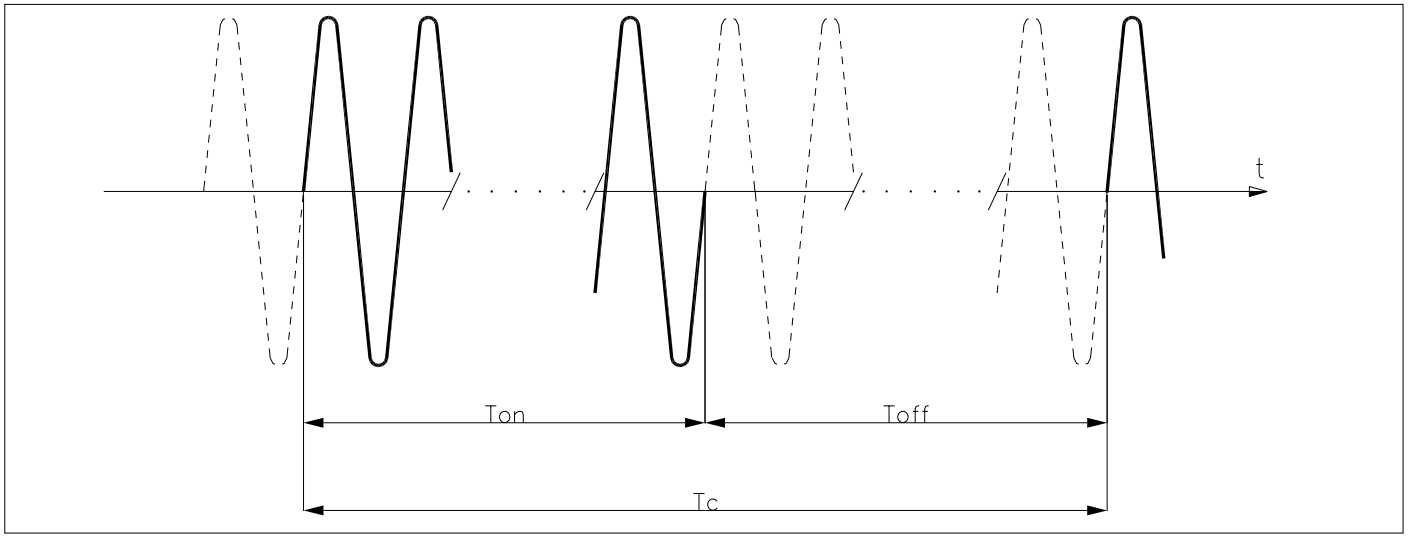
NOTES: USE WITH INDUCTIVE LOADS AND TRANSFORMERS

a) Connect a varistor (MOV) between each wire of the primary transformer and ground.
Varistor data: rated voltage 660Vrms,…, 1000Vrms; minimum energy 100J
b) The maximum current controllable by the device is less than the product's rated value (see technical data).
c) In ZC and BF trigger mode, use the Delay-triggering function to limit peak magnetization current.
d) In PA trigger mode, use the Softstart function.
e) DO NOT use HSC trigger mode.
f) DO NOT connect RC snubbers in parallel to the transformer primary.
g) Select the inductive load using the Hd.1 parameter (ref. Software manual)

Trigger modes
The GTF has the following power control modes:
- modulation via variation of number of conduction cycles with zero crossing trigger.
- modulation via variation of phase angle.

Zero Crossing mode
This function eliminates EMC noise. This mode controls power on the load via a series of conduction ON and non conduction OFF cycles.
ZC - constant cycle time (Tc ≥ 1 sec, settable from 1 to 200 sec)
Cycle time is divided into a series of conduction and non conduction cycles in proportion to the power value to be transferred to the load.

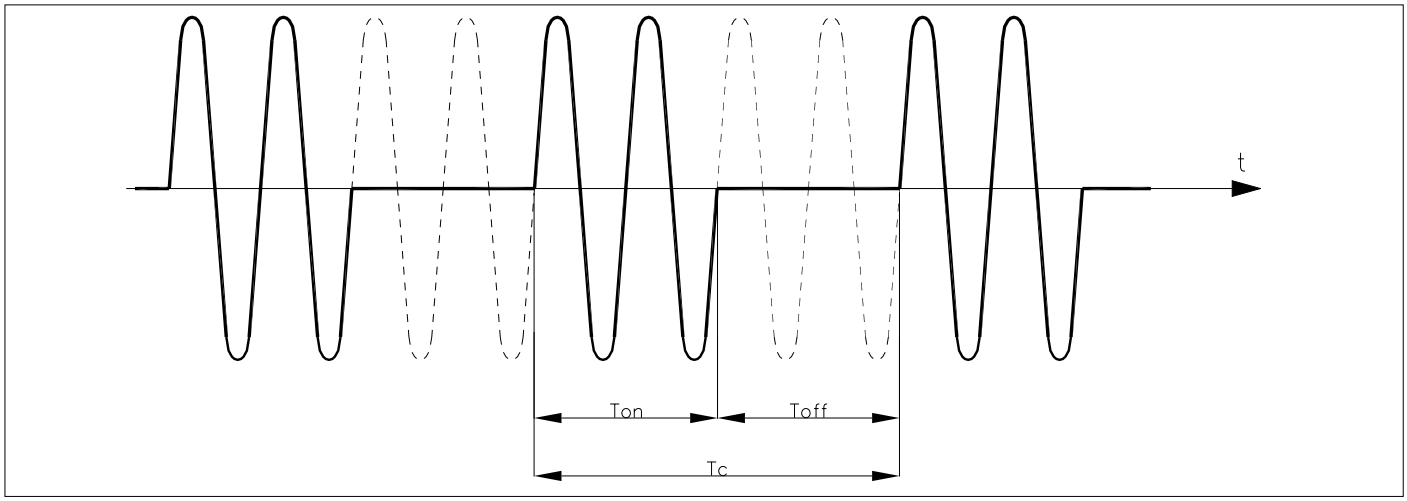
Figure 18



For example, if Tc = 10sec, if the power value is 20% there is conduction for 2 sec (100 conduction cycles @ 50Hz) and non conduction for 8 sec (400 non conduction cycles @ 50Hz).

BF - variable cycle time (GTT)
This mode controls power on the load via a series of conduction ON and non conduction OFF cycles.
The ratio of the number of ON cycles to OFF cycles is proportional to the power value to be supplied to the load.
The CT repeat period is kept to a minimum for each power value (whereas in ZC mode the period is always fixed and not optimized).

Figure 19

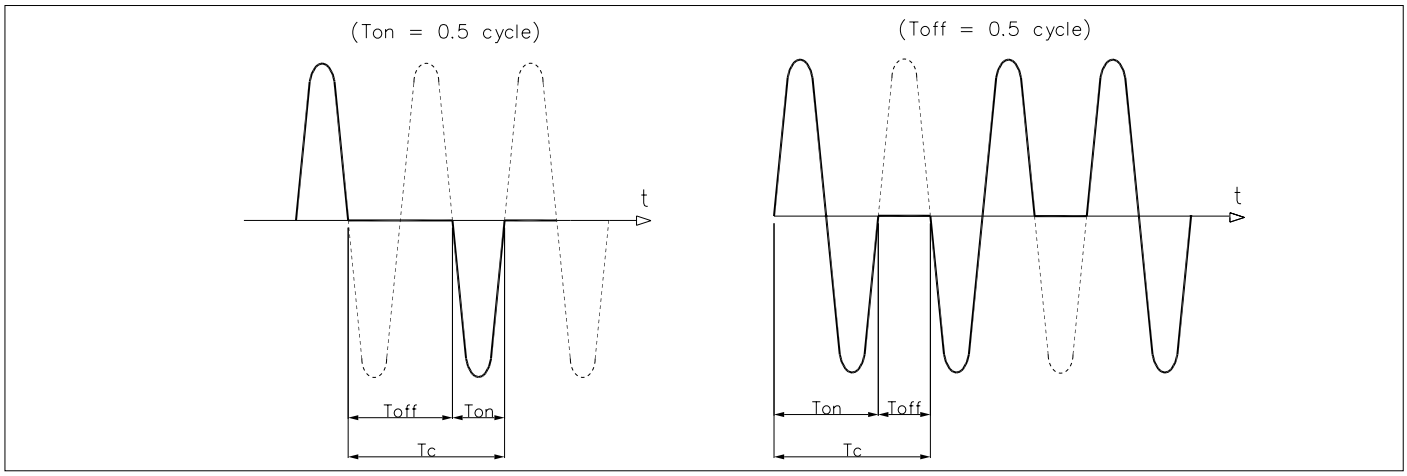


parameter defines the minimum number of conduction cycles settable from 1 to 10.
In the following example, the parameter = 2.

HSC - Half single cycle

This mode corresponds to Burst Firing that manages ON and OFF half-cycles. It is useful for reducing the flickering of filaments with short/medium-wave IR lamp loads. With these loads, to limit operating current with low power, it is useful to set a minimum power limit (for example, Lo.p = 10%).
NB: This mode is NOT allowed with inductive loads (transformers) It is used with resistive loads in single-phase, star with neutral, or open delta configuration.

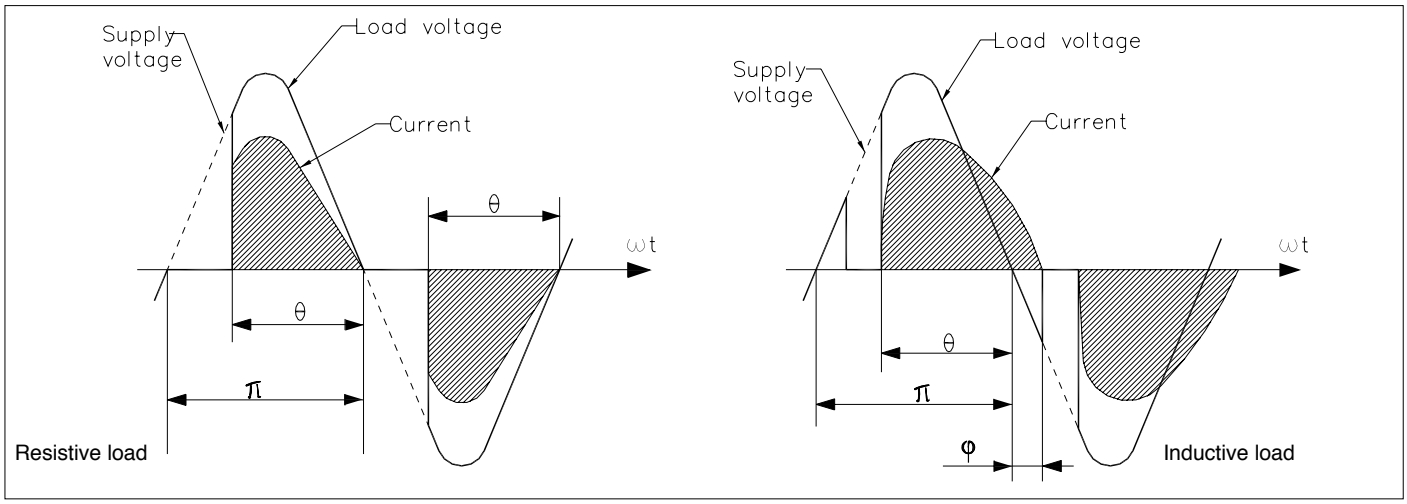
Figure 20



Example of operation in HSC mode with power at 33 and 66%.

Phase angle (PA)
This mode controls power on the load via modulation of trigger angle θ
Example: if power to be transferred to the load is 100%, θ = 180°
or if power to be transferred to the load is 50%, θ = 90°

Figure 21

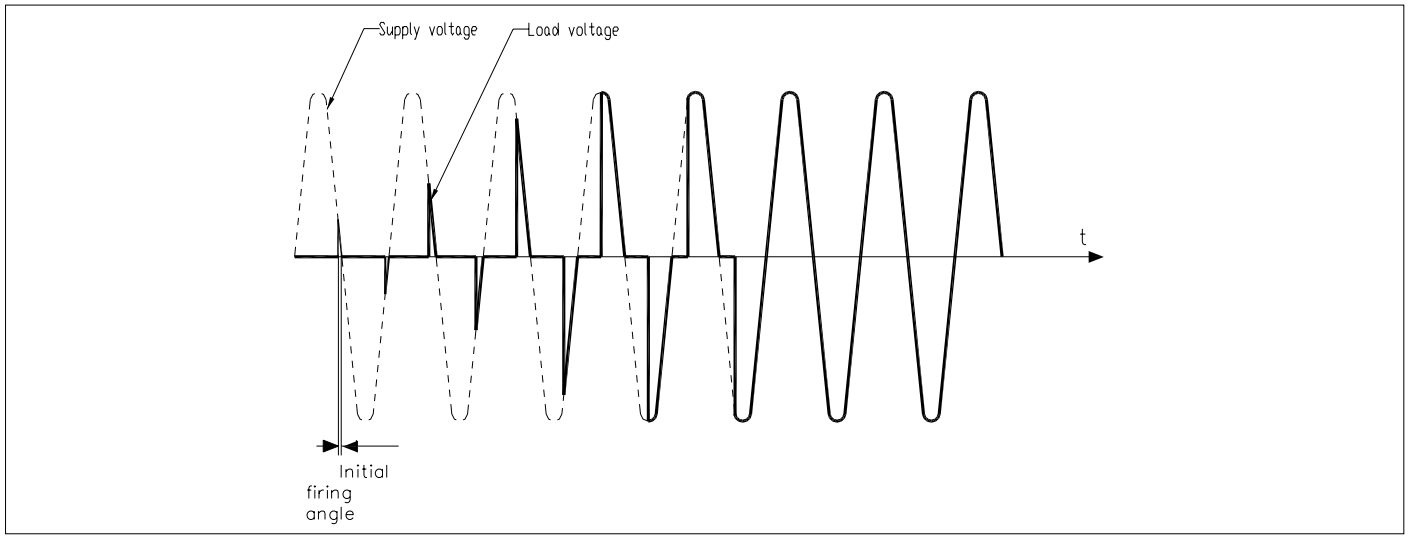


ADDITIONAL FUNCTIONS

Softstart

This type of start can be enabled either in phase control or pulse train mode and in zero-crossing mode (ZC, BF, HSC).
In phase control, the increment of conduction angle q stops at the corresponding value of the power to be transferred to the load.
Control of maximum peak current (useful in case of short circuit on the load or of loads with high temperature coefficients to automatically adjust start time to the load) can be enabled during softstart. When the load shut-off time (settable) is exceeded, the ramp is reactivated at the next power-on.

Figure 22

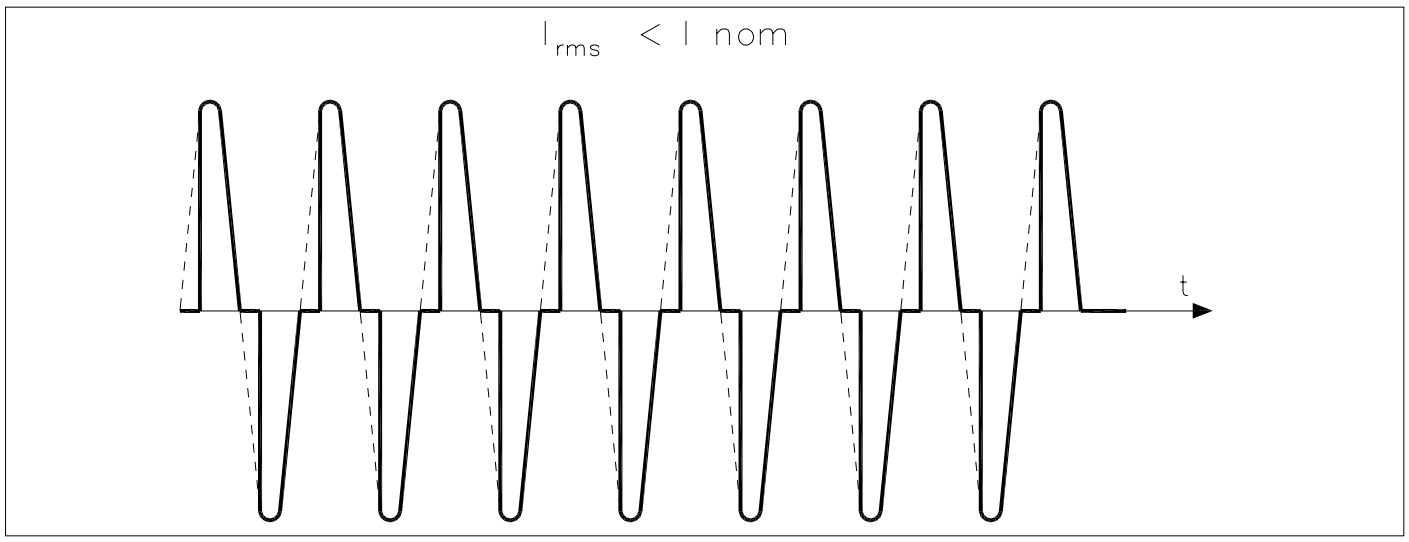


Example of firing ramp with phase Soft-Start

RMS current limit

The option for controlling the load current limit is available in all work modes.
If the current value exceeds the limit (settable in the nominal full-scale range) in mode PA the conduction angle is limited, while in zero-crossing mode (ZC, BF, HSC) the cycle time conduction percentage is limited.
This limitation ensures that the RMS value (i.e., not the instantaneous value) of the load current does NOT exceed the set RMS current limit.

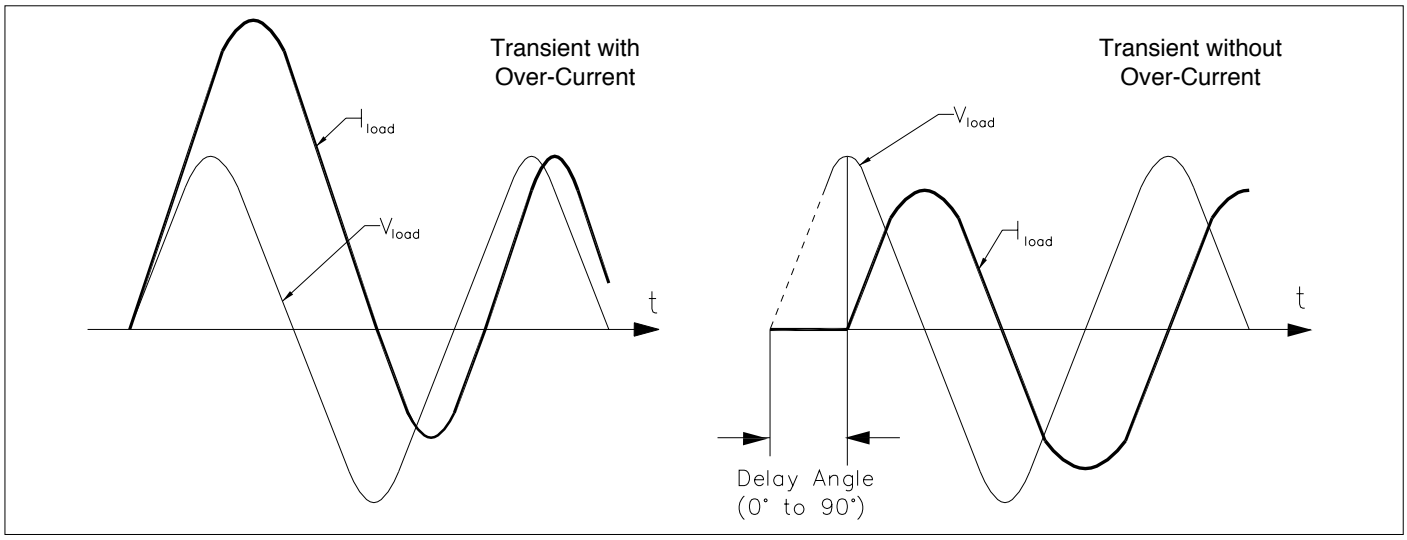
Figure 23



Example of conduction angle limitation in PA mode to respect an RMS current limit below the nominal current of the load.

DT - “Delay triggering” (for ZC, BF control modes only)
Settable from 0° to 90°.
Useful for inductive loads (transformer primaries) to prevent current peak that in certain cases could trip the high-speed fuses that protect the SCRs.

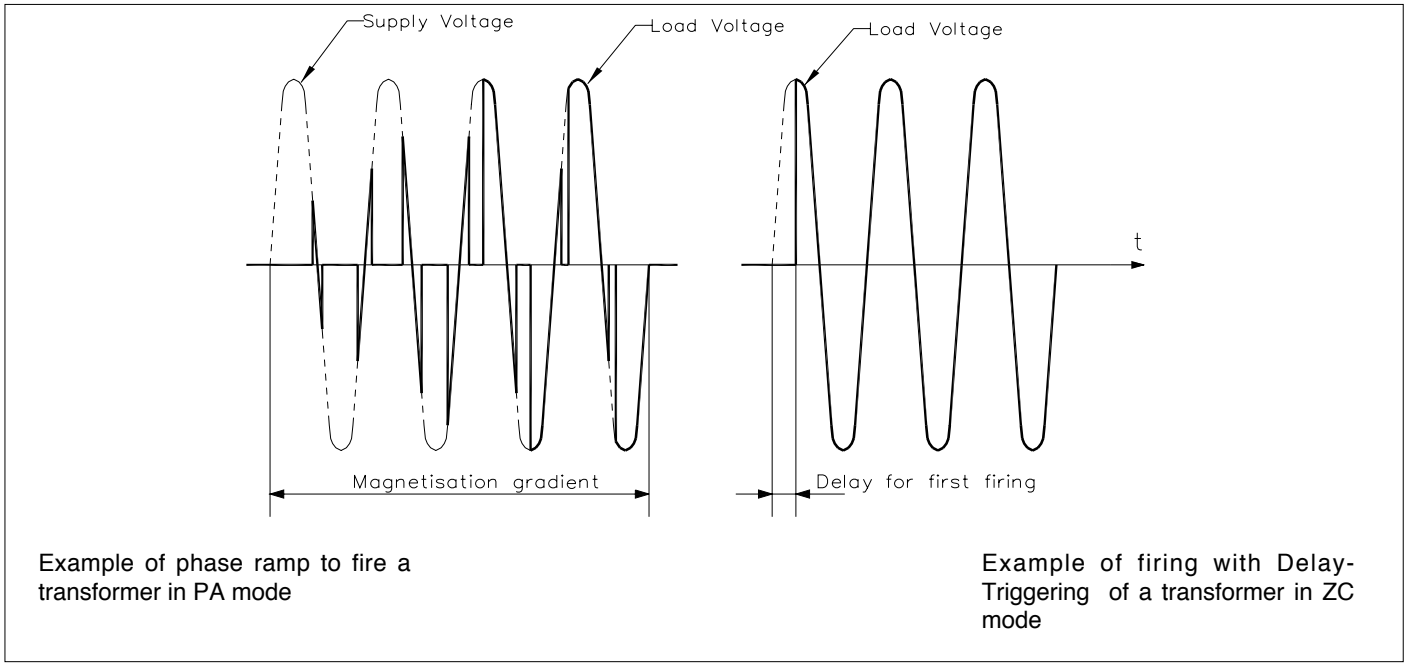
Figure 24



Example of firing of inductive load with/without delay-triggering.

To conduct inductive loads controlled in PA mode, do not use delay triggering; instead, use the phase Soft-Start ramp.

Figure 25



Example of phase ramp to fire a transformer in PA mode

Example of firing with Delay-Triggering of a transformer in ZC mode

Comparison of method to fire a transformer: Soft-Start Ramp (for PA mode) / Delay triggering (for ZC and BF mode)

3.10 OVERCURRENT FAULT PROTECTION

This function eliminates the need for an external extra-rapid fuse to protect the device. The SHORT_CIRCUIT_ CURRENT alarm trips when the peak current on the load exceeds maximum permitted value (corresponding to twice the rating) during the softstart ramp or at first power-on (with softstart ramp disabled).
If configured (Fr.n parameter other than zero), the device restarts automatically in softstart for a maximum number Fr.n of attempts, beyond which it remains deactivated while waiting for manual reset with front panel key BUT or with the control via serial (bit 16).

83	Fr.n	R/W	Number of restarts in case of FUSE_OPEN

16 bit	Reset alarms SHORT_CIRCUIT_CURRENT E FUSE_OPEN	R/W	OFF= - ON = Reset alarms SHORT_CIRCUIT_CURRENT e FUSE_OPEN

- DOES NOT replace any of the safeties on the system (such as magnetothermic switches, delay fuses, etc.).

- Protects the controller (and therefore also the load) by replacing the high-speed fuse needed to protect the control SCRs against faults (without creating any additional cost to replace the fuse and reducing machine downtime).

-Has 2 function states:

√ Normal (On-Off control of load power)

√ Fuse-Open: GTF is open (a short occurred during normal operation).

Conditions of use

- Breaking capacity: 5 KA - 480V
- Max. system inductance: 1000 uH

DIFFERENCES AMONG SHORT CIRCUIT PROTECTION DEVICES

Characteristics	Fuses	Magnetothermics	Overcurrent Fault Protection
Opening technique	• Metal melting • Contact withdrawal with preloaded spring	• Thermal effect • Magnetic effect • Mechanical release	• Current threshold • Device shutdown
Arc quenching	• Arc in air / sand • Quenching with silica sand / spring effect	• Mechanical separation of 2 contacts • Arc in air with quenching in chamber	• No arc in air (current shuts down in silica)
Opening energy (I^2t of opening)	Depending on model: • Low – medium – high	Depending on model: • Medium – high	• Always very low
Opening time	Depending on model: • Low – medium – high	Depending on model: • Medium – high	• Always very low (micro-seconds)
Reset	• Replacement • Labour cost + fuse change	• Manual reset	• Manual reset • Automatic reset (“FR.n” times) • Remote reset (via serial)

3.11 DIGITAL INPUT (PWM)

This digital input can be used to receive information on the % of power to be supplied to the load.
The signal can be generated by a controller or external plc via digital outputs (logic output for Gefran instrumentation).
This is obtained by alternating the output in ON for time TON with the output in OFF for time TOFF.
The sum of TON+TOFF is constant, and is called CycleTime.

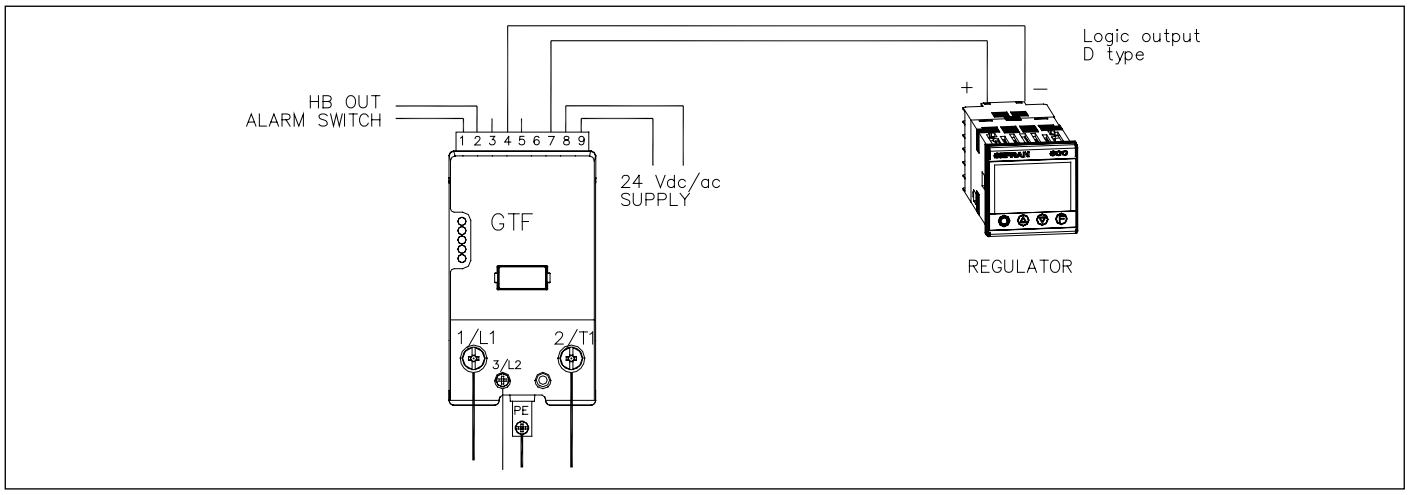
CycleTime= TON+TOFF

The power level is given by the ratio = TON/ CycleTime and is normally expressed in %.
The GTF digital input automatically adapts to the cycle time from 0.03Hz to 100Hz and obtains the power % to be supplied to the load from the TON/(TON+TOFF) ratio.

Connection example:

Temperature control with Gefran 600 with D type logic output (out2) (cycle time: 0.1sec), logic output can drive max 3 GTF in series (preferable), connection allowed only if GTFs do not have interconnected GNDs (if so, make parallel connection).
To use Digital PWM the GTF can be ordered with the configuration **5 -x - M** or must be configured with the parameter dIG (digital input) = 7 (see Fig. 46, 47).

Figure 26



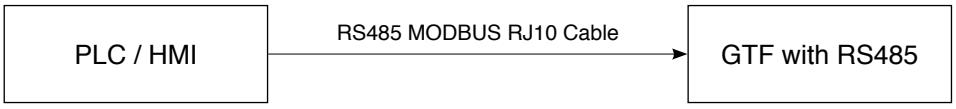
4 • INSTALLATION OF THE SERIAL PORT

A network typically has a Master that “manages” communication by means of “commands,” and Slaves that carry out these commands.
GTF modules are considered Slaves to the network master, which is usually a supervision terminal or a PLC.
It is positively identified by means of a node address (ID) set on rotary switches (tens + units).
A maximum of 99 GTF, modules can be installed in a serial network, with node address selectable from “01” to “99”
GTF modules have a ModBus serial (Optional)
The MODBUS RTU port 1 has the following factory settings (default):

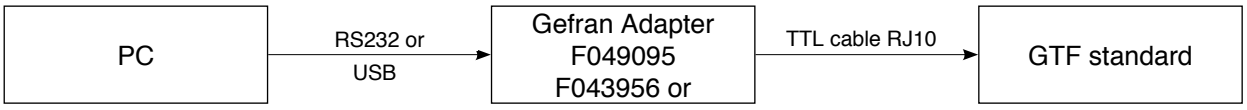
Parameter	Default	Range
ID	1	1...99
BaudRate	19,2Kbit/s	1200...19200bit/s
Parity	None	Odd/Even/None
StopBits	1	-
DataBits	8	-

The following procedures are indispensable for the Modbus protocol.
Set the rotary switch at “0+0” for AutoBaud function

Parameter	Position rotary switches tens	unit	
AutoBaud	0	0	Allows setting of the correct BaudRate value automatically detecting the master transmission frequency



NOTE
The standard products DO NOT feature the comunication RS485 Modbus serial port, but can be configured via PC with Gefran GF-Express Software, by connecting it to TTL port of GTF to PC, by means of TTL cable equipped with SW.



NEVER connect TTL adaptator to RS485 serial port of GTF.
NEVER connect TTL connector or GTF to a RS485 serial web .
Danger of product damage!!

4.1 “AUTOBAUD SERIAL 1” sequence

Function

Adapt the serial communication speed and parity of the GTF modules to the connected supervision terminal or PLC.

The “RUN”and “STATUS” LEDs mentioned in the procedure can vary its behavior based on on he parameters Ld.1 e Ld.2

Procedure

1) Connect the serial cables for all modules on the network t and to the supervision terminal.

2) Set the rotary switch on the GTF modules to be installed, or on all modules present in case of first installation, to position “0+0”.

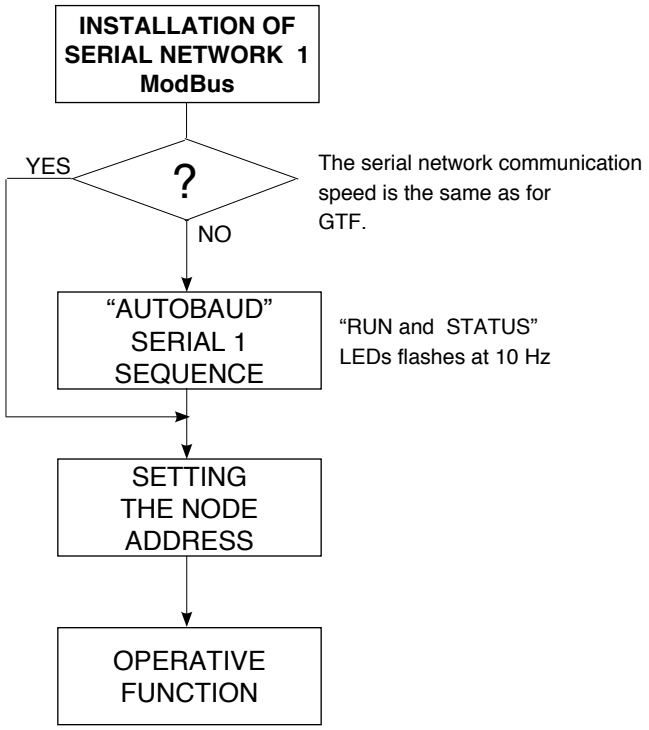
3) Check that the “RUN” and “STATUS” LEDs flash at high frequency (10Hz).

4) The supervision terminal must transmit a series of generic “MODBUS” read messages to the network.

5) The procedure is over when all of the “RUN” and “STATUS”LEDs on the GTF modules flash at a normal frequency (2Hz) (if parameter 50 Ld.1 = 16 as default).

The new speed parameter is saved permanently in each GTF; therefore, the “AUTOBAUD SERIAL” sequence does not have to be run at subsequent power-ups.

When the rotary switch is turned, the green “STATUS” LED stays on steadily for about 6 seconds, after which it resumes normal operation and saves the address.


INSTALLATION OF SERIAL NETWORK 1 ModBus
YES
?
NO
The serial network communication speed is the same as for GTF.
“AUTOBAUD” SERIAL 1 SEQUENCE
“RUN and STATUS” LEDs flashes at 10 Hz
SETTING THE NODE ADDRESS
OPERATIVE FUNCTION

5 • TECHNICAL CHARACTERISTICS

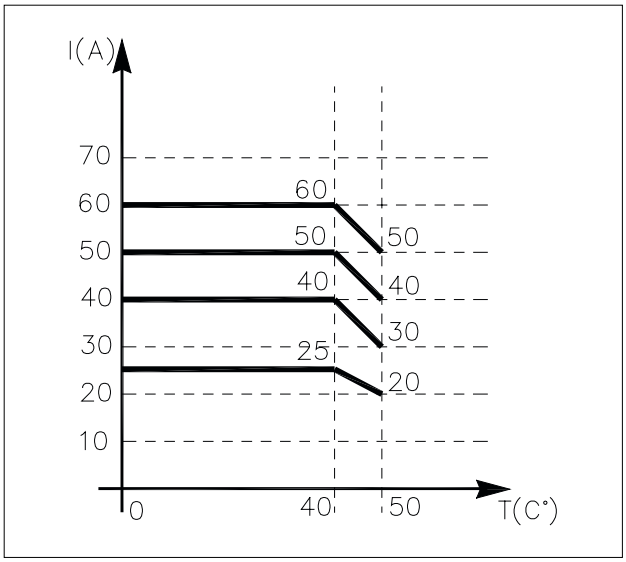
INPUTS	
IN1 Analogic control inputs	
Function	Acquisition of control power
Max. error	1% f.s.+/- 1 scale point at ambient temperature of 25°C
Thermal drift	< 100 ppm/°C of f.s.
Sampling time	60 ms
Scale 0 -10V	Input impedance > 40 Kohms
Scale 0-5V	Input impedance > 40 Kohms
Scale 0-20mA or 4-20mA	Internal Shunt resistance: 125 ohm
Potentiometer input	Potentiometer resistance: from 1 Kohm to 47 Kohm Potentiometer supply: +5V (supplied by GTF, max 10mA)
Linear input read scale	0 .... 100.0 %
INDIG Digital Input	
Function	Power Disable input or PWM input
Voltage range	5-30V (max 7 mA)
State “0” read safe voltage	< 2 V
State “1” read safe voltage	> 5V
PWM input	Maximum frequency: (0.03Hz,...,100 Hz) maximum resolution 1% (0.1ms)
Measures voltage and line current	
Function measures the load current	Measures RMS voltage by integral calculation of sampled values Meas. range: 0 ... 2 * rated_product
Accuracy RMS current measurement	3 % f.s. at room temperature of 25°C In PA mode with conduction angle >90° : 5% fs Thermal drift: < 200 ppm/°C
RMS line current measurement function	RMS voltage meas. by integral calculation of sampled values Work voltage range: 90...480Vac)
Accuracy RMS voltage measurement	1 % f.s. at room temperature of 25°C Thermal drift: < 100 ppm/°C
Sampling time current/voltage	0,25 ms
Line frequency	50 / 60 Hz
OUTPUTS	
CONTROL OUTPUT MASTER/SLAVE	
Function	Control for synchronising another GTF or GTS slave (4 slave max.) Voltage: 7.5V , max 25 mA
HB ALARM OUTPUT	
Function	HB alarm output or of other configurable alarms
Type	Solid state relay (MOS opto) Isolated contact, normally open Imax: 150mA Vmax. 30 Vac / Vdc Closing resistance < 15 ohm
COMMUNICATIONS PORTS	
RS485 Modbus (Optional)	
Function	Local serial communication
Protocol	ModBus RTU
Baudrate	Settable 1200 …19200 bit/s (default 19,2Kbit/s)
Node address	Settable with two rotary-switches (rotary-switches)
Type	RS485 - double connector RJ10 telephone type 4-4
Isolation	500V
TTL serial connector (Standard)	
Function	For product initial configuration only, via PC. Use a PC connected to GTF, ONLY via Gefran adapter Code F049095 (PC with USB) or Code F043957 (PC with RS232)
Isolation	TTL serial NOT isolated of CPU

POWER (SOLID-STATE)				
CATEGORY OF USE (Tab. 2 EN60947-4-3)	AC 51 resistive or low inductance loads AC 55b short wave infrared lamp (SWIR) AC 56a: transformers, (Request application check)			
Trigger mode	**PA** - Load management by adjusting the firing angle (only configuration single-phase or delta open) **ZC** - Zero Crossing with constant cycle time (settable in range 1-200sec) **BF** - Burst Firing with variable cycle time (GTT) optimized minimum. **HSC** - Half Single Cycle corresponds to Burst Firing that includes ON and OFF half-cycles. Useful for reducing flicker with short-wave IR loads (applied only to single-phase resistive or 3-phase 6-wire open delta loads).			
Feedback mode	**V, V2:** Voltage feedback proportional to RMS voltage value on load (useful to compensate possible variations in line voltage). **I, I2:** Current feedback: bound to RMS current value on load to compensate variations in line voltage and/or variations in load impedance. **P:** Power feedback: proportional to real power value on load (useful to keep constant values of electrical power assigned regardless of load impedance or line voltage variations).			
Max rated voltage	480Vac			
Work voltage range	90…530Vac			
Non-repetitive voltage	1200Vp			
Rated frequency	50/60Hz auto-determination			
Rated current AC51 -AC55b non-inductive or slightly inductive loads, IR lamps (@ Tamb = 40°C)	MODEL GTF			
	25	40	50	60
	25A	40A	50A	60A
Rated current AC56A permitted trigger modes: ZC, BF con DT (Delay Triggering),PA with softstart (@ Tamb =40 °C)	20A	32A	40A	50A
Overcurrent Fault Protection function	This option eliminates the need for an external extra-rapid fuse to protect the device. In case of load short-circuit, the internal IGBT device is instantaneously switched off and the alarm status is signaled.			
Critical Dv/dt with output deactivated	1000V/µsec			
Held nominal voltage of on the impulse	4KV			
Breaking	5KA/480V			
FUNCTION				
Diagnostics	Detection of short load circuit absence line voltage, HB alarm (partial breakage of load)			
OPTIONS				
Options	- Timed Soft-Start firing ramp, with or without peak current control - Soft-Start firing ramp, specific for infrared lamps - Timed shut-off ramp - Limitation of RMS current in load - 0-90° Delay-Triggering for firing inductive loads in ZC and BF mode			
Diagnostic	- SSR in short circuit (presence of current with OFF control) - Absence of SSR current when under load. - Overtemperature alarm <u>Current read</u> • HB alarm interrupted or partially interrupted load • Automatic calibration of HB alarm setpoint starting from current value in load • Alarm for load in short circuit or overcurrent <u>Voltage read</u> • No line voltage			
GENERAL DATA				
Power supply	GTF 25-60A: 24 Vac 50-60 Hz / Vdc ± 25%, max 3VA			
Power supply external fan (only for 40, 50,60A model)	24 Vdc ± 10%, max 200mA			
Signals	5 leds: RUN: run state of CPU STATUS: operating state ALARM: state of alarm output DIGITAL INPUT: state of digital inputs ON / OVER-TEMP.: state control tirystor / Alarm for overheating			
Load type and connection	Single phase load Independent single-phase load in open delta 3-phase load 3-phase load (star without neutral or closed triangle) with bi-phase control			

GENERAL DATA	
Protection	IP20
Work/storage temperature	0…40°C (refer to dissipation curves) / -20 °C - +70 °C average temperature over a period of 12:0 am not exceeding 35° C (according to EN 60947-4-3 § 7.1.1)
Relative humidity	20…85% RH non-condensing
Ambient conditions for use	indoor use, altitude up to 2000m
Installation	DIN bar EN50022 or panel with screws
Installation requirements	Installation category II, pollution level 2, double isolation (only for model >120A): - Max. temperature of air surrounding device 40°C; for temperature >40°C refer at derating curves - Device type: “UL Open Type”
Weight GTF 25A	0,97 Kg
GTF 40, 50A	1,1 Kg
GTF 60A	1,5 Kg

5.1 Derating Curves

Figure 27



This section contains information on order codes for the Controller and its main accessories.

As mentioned in the Preliminary Instructions in this User Manual, a correct reading of the Controller order code immediately identifies the unit's hardware configuration. Therefore, you must always give the order code when contacting Gefran Customer Care for the solution to any problems.

GTF - [ ] 480 [ ] 1 2 [ ]

NOMINAL CURRENT	
25A	25
40A	40
50A	50
60A	60

FIELDBUS	
0	Absent
M	MODBUS RTU

CONTROL OPTIONS	
0	Absent
1	Current limit
2	Current limit and feedback V, I, P

Note: All models have 480VAC nominal voltage and are equipped with a partial/ total load interrupt (HB) function)

1 B M

Signal control (configurable)	
10V (Default)	1
5V/Potentiometer	2
0-20mA	3
4-20mA	4
PWM/Digital input	5

Trigger modes (configurable)	
ZC	Z
BF (Default)	B
HSC	H
PA	P

Function type (configurable)	
Master (Default)	M
Slave	S
Slave dual-phase	S2

Note:

Configurator Standard 1-B-M, if not differently specified .

Substitution model:

GTS ***GTF - X - 480 - 0 - 0 - 0 - 0 - 5 - Z - S***

GTT without load interrupted option

GTF - X - 480 - 0 - 0 - 0 - 0 - 1 - B - M

GTT with load interrupted option

GTF - X - 480 - 0 - 1 - 0 - 0 - 1 - B - M

6.1 ACCESSORIES

CONFIGURATION KIT

KIT PC USB / RS485 o TTL

kit for PC via the USB port (Windows environment) for GTF standard configuration (TTL port) for configuration of GTF with the RS485 option

Lets you read or write all of the parameters of a single GTF
A single software for all models
• Easy and rapid configuration
• Saving and management of parameter recipes
• On-line trend and saving of historical data

Component Kit:
- Connection cable PC USB <----> GTF port TTL
- Connection cable PC USB <----> GTF RS485 port
- Serial line converter
- CD SW GF Express installation

ORDERING CODE
GF_eXK-2-0-0.....Cod. F049095

6.2 FUSE GG

The electric protection device called FUSE GG must be done in order to grant the protection against the electric cable short cirrcuit (see EN60439-1, par. 7.5 “Short-circuit protection and short-circuit with stand strength” and 7.6 “Switching devices and components installed in assemblies”, otherwise the equivalent EN61439-1 paragraphs)